

Sangkook Choi

Curriculum Vitae

Address: 734 Brookhaven ave. Upton, NY, USA, 11973

E-mail: sangkookchoi@gmail.com

Phone: +1-510-421-3448

Academic Appointments

- GW+DMFT Team leader at **the Center for Computational Design of Functional Strongly Correlated Materials and Theoretical Spectroscopy**, Brookhaven National Lab, Jan. 2016-present.
- Postdoctoral Associate, under the guidance of **Prof. Gabriel Kotliar and Prof. Kristjan Haule**, Physics, **Rutgers University**, Jan. 2014-Dec. 2015.
- Graduate Student Researcher, **Prof. Steven G. Louie** group, **The University of California at Berkeley**, Jun. 2008 ~ 2013
- Graduate Student Instructor, Physics department, University of California at Berkeley, Sep. 2007 ~ May. 2009
- Researcher, **Prof. Jisoon Ihm group**, Seoul National University, Seoul, Korea, May 2007 ~ Jun. 2007
- Researcher, Research Center for Spin Dynamics & Spin-Wave Devices, Seoul National University, Seoul, Korea, Sep. 2006 ~ Apr. 2007
- Graduate Student Researcher, Prof. Sang-Koog Kim group, Seoul National University, Seoul, Korea, Sep. 2004 ~ Aug. 2006
- Undergraduate Research Assistant, Prof. Sang-Koog Kim group, Seoul National University, Seoul, Korea, Sep. 2002 ~ Aug. 2003

Education

- Ph.D. **Prof. Steven G. Louie group**, Physics, University of California at Berkeley, 2013
 - Electron-electron interaction effects on materials properties using *ab initio* and model Hamiltonian calculation, with emphasis on defects, interfaces, and nanostructures
- M.S., Materials Science & Engineering, Seoul National University, Seoul, Korea, 2006
 - Wave Properties of Dipole-Exchange Spin Waves in Geometrically Confined Ferromagnetic Thin Films Studied by Micromagnetic Simulations
- B. S., Major: Materials Science & Engineering, Minor: Physics, Seoul National University, Seoul, Korea, 2004

Honors

- **Samsung Scholarship**, Samsung Foundation of Culture, Sep. 2007 ~ Aug. 2012
- Lecture & Research Support Scholarship, Seoul National University, Seoul, Korea, Mar. 2006 ~ Sep. 2006
- **Best Presentation Award**, Quantum Photonic Science Research Center, Seoul, Korea,

Aug. 1, 2006

- **Best Presentation Award**, The Korean Physical Society Spring Meeting, Apr. 20, 2006
- Research Support Center Scholarship, College of Engineering, Seoul National University, Seoul, Korea, Sep. 2005 ~ Feb. 2006
- Superior Academic Performance Scholarship, Seoul National University, Seoul, Korea, Mar. 1998 ~ Feb. 1999 and Sep. 2004 ~ Feb. 2006
- **Best Undergraduate Student Award**, Department of Materials Science & Engineering, Seoul National University, Seoul, Korea, Apr. 11, 2004
- Hanglas Scholarship, Hanglas foundation, Hanglas Group, Mar. 2002 ~ Feb. 2004
- Deukcheun Scholarship, Deukcheun foundation, Changsung Corporation, Mar. 1999 ~ Feb. 2000

Publications

- **S. Choi**, A. Kutepov, K. Haule, M. van Schilfgaarde, and G. Kotliar, “First-principles treatment of Mott insulators: linearized QSGW+DMFT approach”, **npj Quantum Materials** 1, 16001 (2016).
- **S. Choi**, C.-H. Park, and S. G. Louie “Electron Supercollimation in Graphene and Dirac Fermion Materials Using One-Dimensional Disorder Potentials”, **Phys. Rev. Lett** 113, 026802 (2014).
- K. Liu, X. Hong, **S. Choi**, C. Jin, R. B. Capaz, J. Kim, S. Aloni, W. Wang, X. Bai, S. G. Louie, E. Wang, and F. Wang, “Systematic Determination of Absolute Absorption Cross-section of Individual Carbon Nanotubes”, **Proc. Natl. Acad. Sci.** 111, 7564 (2014).
- Y. Wang, D. Wong, A. V. Shytov, V. W. Brar, **S. Choi**, Q. Wu, H.-Z. Tsai, W. Regan, A. Zettl, R. K. Kawakami, S. G. Louie, L. S. Levitov, and M. F. Crommie, “Observing Atomic Collapse Resonances in Artificial Nuclei on Graphene”, **Science**, 340, 734 (2013).
- **S. Choi**, J. Deslippe, R. B. Capaz, and S. G. Louie, “An Explicit Formula for Optical Oscillator Strength of Excitons in Semiconducting Single-Walled Carbon Nanotubes: Family Behavior”, **Nano Lett.** 13, 54 (2013).
- **S. Choi**, M. Jain, and S. G. Louie, “Mechanism for optical initialization of spin in NV⁻ center in diamond”, **Phys. Rev. B** 86, 041202(R) (2012).
- **S. Choi**, D.-H. Lee, S. G. Louie, and J. Clarke, “Localization of Metal-Induced Gap States at the Metal-Insulator Interface: Origin of Flux Noise in SQUIDs and Superconducting Qubits”, **Phys. Rev. Lett.** 103, 197001 (2009).
 - selected for Virtual Journal of Nanoscale Science & Technology, Virtual Journal of Quantum Information, and Virtual Journal of Applications of Superconductivity.
- S.-K. Kim, **S. Choi**, K.-S. Lee, D.-S. Han, D.-E. Jung, and Y.-S. Choi, “Negative refraction of dipole-exchange spin waves through a magnetic twin interface in restricted geometry”, **Appl. Phys. Lett.** 92, 212501 (2008).
- **S. Choi**, B. W. Jeong, S. Kim, and G. Kim, “Monovacancy-induced magnetism in

graphene bilayers", J. Phys. Condens. Matter 20, 235220 (2008).

- J.-Y. Lee, K.-S. Lee, **S. Choi**, K. Y. Guslienko, and S.-K. Kim, "Dynamic Transformations of the Internal Structure of a Moving Domain Wall in Magnetic Nanostripes ", Phys. Rev. B 76, 184408 (2007).
 - selected for Virtual Journal of Nanoscale Science & Technology.
- **S. Choi** and S.-K. Kim, "Total Reflection and Negative Refraction of Dipole-Exchange Spin Waves at Magnetic Interfaces: Micromagnetic Modeling Study", arXiv:0708.1642.
- **S. Choi**, S.-K. Kim, V. Demidov, and S. Demokritov "Double-contact spin-torque nano-oscillator with optimized spin-wave coupling: Micromagnetic modeling", Appl. Phys. Lett. 90, 083114 (2007).
 - selected for Virtual Journal of Nanoscale Science and Technology.
- **S. Choi**, K.-S. Lee, K. Y. Guslienko, and S.-K. Kim, "Strong Radiation of Spin Waves by Core Reversal of a Magnetic Vortex and their Wave Behaviors in Magnetic Nanowire-Waveguides", Phys. Rev. Lett. 98, 087205 (2007).
 - selected for the "research highlights" at **Nature** 445, 5(2007), and Virtual Journal of Nanoscale Science and Technology.
- **S. Choi**, K.-S. Lee and S.-K. Kim, "Spin-wave interference", Appl. Phys. Lett. 89, 062501 (2006).
 - selected for the **cover image** of the issue, Virtual Journal of Nanoscale Science and Technology, and Virtual Journal of Ultrafast Science 5(9) (2006)
- J.-Y. Lee, **S. Choi**, and S.-K. Kim, " Dynamics of transverse magnetic domain walls in rectangular-shape thin-film nanowires studied by micromagnetic simulations", J. Magn. 11, 74 (2006).
- K.-S. Lee, **S. Choi** and S.-K. Kim, " Radiation of spin waves from magnetic vortex cores by their dynamic motion and annihilation processes", Appl. Phys. Lett. 87, 192502 (2005).
 - selected for the **cover image** of the issue

Supercomputer allocations

- 1,000,000 computing hours, the Oak Ridge Leadership Computing Facility Director Discretion Project, "Application of MQSGW+DMFT to delta plutonium"

Patents

- S.-K. Kim, K.-S. Lee, and **S. Choi** " Method of generating strong spin waves and spin devices for ultra-high speed information processing using spin waves", PCT / KR2006 / 003874, US patent number. 8164148.
- S.-K. Kim, K.-S. Lee, and **S. Choi** " Method of generating strong spin waves and spin devices for ultra-high speed information processing using spin waves", 10-2006-92742, Korean Industrial Property (2006. 09. 25. applied).

- S.-K. Kim, K.-S. Lee, **S. Choi**, and J. H. Yu " Method of generating strong spin waves and spin devices for ultra-high speed information processing using spin waves", 10-2005-91506, Korean Industrial Property (2005. 09. 29. applied).

Invited Talks

- **S. Choi**, "GW+DMFT: a diagrammatically controlled ab initio theory of strongly correlation in real materials", Many electron summer school, Brookhaven National Lab, NY, Jun. 22, 2016
- **S. Choi**, "GW+DMFT: a diagrammatically controlled ab initio theory of strongly correlation in real materials", Condensed-Matter Physics & Materials Science Seminar, Brookhaven National Lab, NY, Oct. 20, 2015

Contributed Talks

- **S. Choi**, A. Kutepov, K. Haule, M. van Schilfgaarde, and G. Kotliar "Matsubara QSGW+DMFT: application to Mott insulator La_2CuO_4 ", Many electron summer school, Stony Brook, NY, Jun. 8-12, 2015
- **S. Choi**, A. Kutepov, K. Haule, M. van Schilfgaarde, and G. Kotliar, "Electronic structure of La_2CuO_4 within self-consistent GW approximation", APS March meeting, San Antonio, TX, Mar. 2-6, 2015
- **S. Choi**, J. Deslippe, R. B. Capaz, and S. G. Louie, "An explicit formula for optical oscillator strength of excitons in semiconducting single-walled carbon nanotubes: family behavior", APS March meeting, Baltimore, MD, Mar. 18-22, 2013
- **S. Choi**, M. Jain, and S. G. Louie, " Mechanism for optical initialization of spin in NV⁻ center in diamond", APS March meeting, Boston, MA, Feb. 27-Mar. 2, 2012
- **S. Choi**, M. Jain, and S. G. Louie, " First-principles study of the energy and spin structure of excited states of NV⁻ center in diamond and its corresponding Hubbard model parameters", APS March meeting, Dallas, TX, Mar. 21-25, 2011
- **S. Choi**, J. Clarke, D.-H. Lee, and S. G. Louie, "Localization of Metal-Induced Gap States at the Metal-Insulator Interface: Origin of Flux Noise in SQUIDs and Superconducting Qubits", Applied Superconductivity Conference, Applied Superconductivity Conference, Washington, D.C., Aug. 1-6, 2010
- **S. Choi**, D.-H. Lee, S. G.. Louie, and J. Clarke, "Localization of Metal-Induced Gap States at the Metal-Insulator Interface: Origin of Flux Noise in SQUIDs and Superconducting Qubits," APS March Meeting, Portland, OR, Mar. 15-19, 2010
- **S. Choi**, J. Deslippe, and S. G. Louie, "Effective Hamiltonian approach to bright and dark excitons in single-walled carbon nanotubes", A Symposium in Honor of the 60th Birthday of Steven G. Louie, University of California at Berkeley. Mar. 21 - 22, 2009
- **S. Choi**, J. Deslippe, and S. G. Louie, "Effective Hamiltonian approach to bright and dark excitons in single-walled carbon nanotubes", APS March meeting, Pittsburgh, PA, Mar. 16–20, 2009
- **S. Choi** and S.-K. Kim "Wave properties of spin waves in restricted geometries",

International Workshop on Spin Dynamics in Restricted Geometry , Research Center for Spin Dynamics & Spin-Wave Devices, Seoul, Korea, May 26, 2007

- **S. Choi**, K.-S. Lee, and S.-K. Kim, "Reflection and refraction of dipole-exchange spin waves", The 10th Joint MMM/Intermag Conference, Baltimore, MA, Jan. 7–11, 2007
- **S. Choi** and S.-K. Kim "Refractive and reflective characteristics of dipole-exchange spin waves in confined magnetic thin films", The Korean Magnetic Society Winter Meeting, Jeju, Korea, Nov. 23-25, 2006
- **S. Choi**, K.-S. Lee, and S.-K. Kim "Reflective and refractive behaviors of dipole-exchange spin waves", The Korean Physics Society Fall Meeting, Daegu, Korea, Oct. 19-20, 2006.
- **S. Choi**, K.-S. Lee, and S.-K. Kim " Spin-Wave Radiation from a Magnetic Vortex Core and Its Wave Behaviors in Confined Magnetic Structures", The 2nd student workshop, Quantum Photonic Science Research Center, Seoul, Korea, Aug. 1, 2006
- **S. Choi**, K.-S. Lee, and S.-K. Kim "Spin-wave interference", The Korean Magnetic Society Summer Meeting, Jun. 8-10, 2006
- **S. Choi**, S.-K. Kim, and K.-S. Lee, "Vortex-motion driven spin-wave generation and propagation", The Korean Magnetic Society Summer Meeting, Jeju, Korea, Jun. 1-3, 2006
- **S. Choi**, K.-S. Lee, and S.-K. Kim, "Spin-wave radiation from a magnetic vortex core And its wave behaviors in confined magnetic structures", IEEE Internatinoal Magnetic Conference, San Diego, CA, May 8-12, 2006
- **S. Choi**, S.-K. Kim, and K.-S. Lee, "Spin-wave interference", The Korean Physics Society Spring Meeting, Pyeongchang, Korea, Apr. 20-21, 2006
- **S. Choi**, K.-S. Lee, and S.-K. Kim, "Micromagnetic Modeling Studies of Domain-wall Movements in Magnetic Nanowires", The Korean Physics Society Fall Meeting, Jeju, Korea, Oct. 21-23, 2004

Research Interests

- Combining the GW approximation with modern embedding (dynamical mean-field) methods to obtain a realistic description of strongly correlated compounds
- Quantitative calculation of electron-electron interaction effects to the ground state and electronic excitations of materials using first-principles and model Hamiltonian approaches.
- Development of new methods using density functional theory and many-body theory to calculate experimentally observable properties of materials

Research Experience

- Postdoctoral Associate, under the guidance of **Prof. Gabriel Kotliar**, Physics, **Rutgers University**, Jan. 2014-Present.

- Development of the first principles codes to combine the GW approximation with modern embedding (dynamical mean-field) methods for a realistic description of strongly correlated materials
- Graduate Student Researcher, **Prof. Steven G. Louie** group, **University of California at Berkeley**, Spring 2008-Present
 - Study of the disorder effect on the generation of local magnetic moments at the interface between nonmagnetic metal and nonmagnetic insulator
 - Development of model Hamiltonian approach to estimate local magnetic moment density, using Anderson disorder model and Anderson impurity model, at the metal-insulator interfaces
 - Development of general framework to determine extended Hubbard model parameters using first-principles calculation
 - Development of GW-BSE approach to extended Hubbard model for electronic and optical properties of materials.
 - Study of optical initialization mechanism of the negatively charged nitrogen-vacancy center in diamond using exact diagonalization of extended Hubbard model Hamiltonian
 - Derivation of an explicit formula for optical oscillator strength of excitons in semiconducting single-walled carbon nanotubes using GW-BSE calculation of extended Hubbard Hamiltonian.
 - Development of 3 parameter extended Hubbard Hamiltonian of single-walled carbon nanotubes.
 - Development of generalized plasmon pole model for extended Hubbard model to describe the energy dependence of the polarizability of materials.
 - Study of the first principles calculation of the net charge associated a single Ca dimer on a graphene placed on a BN substrate
- Researcher, Prof. Jisoon Ihm group, Seoul National University, Seoul, Korea, May 2007 ~ Jun. 2007
 - First principles study of electronic structure of graphene bilayer with a monovacancy
- Researcher, Research Center for Spin Dynamics & Spin-Wave Devices, Seoul National University, Seoul, Korea, Sep. 2006 ~ Apr. 2007; Graduate Student Researcher, Prof. Sang-Koog Kim group, Seoul National University, Fall 2004-Spring 2006
 - Micromagnetic simulation study of wave properties of dipole-exchange spin waves in geometrically confined ferromagnetic thin films

Teaching Experiences

- Graduate Student Instructor for Prof. Steven. G. Louie, “Quantum theory of Solids”, University of California at Berkeley, Fall 2008 and Spring 2009
- Graduate Student Instructor, “Advanced Lab”, University of California at Berkeley, Fall 2007 and Spring 2008

References

Prof. Steven G. Louie
Department of Physics
University of California at Berkeley
Berkeley, California, 94720
(510) 642-1709
sglouie@berkeley.edu

Prof. Gabriel Kotliar
Department of Physics and Astronomy
Rutgers University
Phone: (732) 445-5500 x4331
Email: kotliar@physics.rutgers.edu

Prof. John Clarke
Department of Physics
University of California at Berkeley
Berkeley, California, 94720
(510)-642-3069
jclarke@berkeley.edu

Prof. Marvin L. Cohen
Department of Physics
University of California at Berkeley
Berkeley, California, 94720
(510) 642-4753
mlcohen@berkeley.edu